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12-23-99

UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	042390.P7752
First Inventor or Application Identifier	Alok Sinha
Title	METHOD FOR COMMUNICATING OCCURRENCE OF EVENTS IN A STORAGE MEDIUM
Express Mail Label No.	EL034433703US

APPLICATION ELEMENTS	ADDRESS TO:	Assistant Commissioner for Patents
See MPEP chapter 600 concerning utility patent application contents		Box Patent Application Washington, DC 20231

1. ☒ Fee Transmittal Form
   (Submit an original, and a duplicate for fee processing)

2. ☒ Specification   [Total Pages 20]
   (preferred arrangement set forth below)
   - Descriptive title of the Invention
   - Cross References to Related Applications
   - Statement Regarding Fed sponsored R & D
   - Reference to Microfiche Appendix
   - Background of the Invention
   - Brief Summary of the Invention
   - Brief Description of the Drawings (*if filed*)
   - Detailed Description
   - Claim(s)
   - Abstract of the Disclosure

3. ☒ Drawing(s) *(35 U.S.C. 113)* [Total Sheets 3]

4. Oath or Declaration   [Total Pages 4]
   a. ☐ Newly executed (original copy)
   b. ☐ Copy from a prior application (37 C.F.R. § 1.63(d))
      (for continuation/divisional with Box 16 completed)
      i. ☐ **DELETION OF INVENTOR(S)**
         Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR §§ 1.63(d)(2) and 1.33(b).

NOTE FOR ITEMS 1 & 13: IN ORDER TO BE ENTITLED TO PAY SMALL ENTITY FEES, A SMALL ENTITY STATEMENT IS REQUIRED (37 C.F.R. § 1.27), EXCEPT IF ONE FILED IN A PRIOR APPLICATION IS RELIED UPON (37 C.F.R. § 1.28).

5. ☐ Microfiche Computer Program (*Appendix*)

6. Nucleotide and/or Amino Acid Sequence Submission
   (if applicable, all necessary)
   a. ☐ Computer Readable Copy
   b. ☐ Paper Copy (identical to computer copy)
   c. ☐ Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

7. ☐ Assignment Papers (cover sheet & document(s))

8. ☐ 37 C.F.R. § 3.73(b) Statement   ☐ Power of Attorney
   (when there is an assignee)

9. ☐ English Translation Document (*if applicable*)

10. ☐ Information Disclosure Statement (IDS)/PTO - 1449   ☐ Copies of IDS Citations

11. ☐ Preliminary Amendment

12. ☒ Return Receipt Postcard (MPEP 503)
    (Should be specifically itemized)

13. ☐ *Small Entity Statement(s)*   ☐ Statement filed in prior application, Status still proper and desired

14. ☐ Certified Copy of Priority Document(s)
    (if foreign priority is claimed)

15. ☐ Other: ....

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16. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in a preliminary amendment:
    ☐ Continuation   ☐ Divisional   ☐ Continuation-in-part (CIP)   of prior application No: _____
    Prior application Information: Examiner_____   Group/Art Unit: _____

For CONTINUATION or DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 4b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

17. CORRESPONDENCE ADDRESS

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Signature		Date 12/21/99

APPLICATION FOR UNITED STATES LETTERS PATENT

FOR

METHOD FOR COMMUNICATING OCCURRENCE OF EVENTS IN A STORAGE
MEDIUM

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"Express Mail" label number EL034433703US

METHOD FOR COMMUNICATING OCCURRENCE OF EVENTS IN A STORAGE MEDIUM

BACKGROUND

5   A redundant array of inexpensive disks (RAID) process refers to a process by which a computing system may store data throughout a storage medium, such as an array of disk drives, so that at least portions of the data may be recovered should part of the storage medium fail. A processor in such a computing system may execute algorithms that determine the appropriate parity bit and location for the data to be stored. However,

10   in large computing systems that frequently store data to disk drives, the burden on this processor to perform the RAID process may be significant. Because of this burden, the computing system may have reduced computing resources available for other tasks.

To reduce the burden on the processor, Intelligent Input/Output (I_2O) controllers have been developed. Simply stated, I_2O processors off-load responsibility for storing

15   data on the disk drives from the processor so that the processor is available to perform other functions. Examples of implementing the I_2O functions are described in the Intelligent Input/Output Architecture Specification, revision 1.5, published March 1997 by the I_2O Special interest Group (see http://www.i2osig.org).

Nonetheless, there is a continuing need for better ways to improve the interaction

20   between applications running on the processor and the disk drives in a computing system that is implementing a RAID data storage process.

BRIEF DESCRIPTION OF THE DRAWINGS

The subject matter regarded as the invention is particularly pointed out and

distinctly claimed in the concluding portion of the specification. The invention, however,

both as to organization and method of operation, together with objects, features, and

5   advantages thereof, may best be understood by reference to the following detailed

description when read with the accompanying drawings in which:

FIG. 1 is a block diagram representation of a computing system in accordance with

an embodiment of the present invention;

FIG. 2 is a block diagram representation of communicative coupling between in

10   accordance with an embodiment of the present invention; and

FIG. 3 is a flow chart illustrating the process by which an application may register

itself with an event interface in accordance with an embodiment of the present invention.

Where considered appropriate, reference numerals have been repeated among the

figures to indicate corresponding or analogous elements.

15   DETAILED DESCRIPTION

In the following detailed description, numerous specific details are set forth in order

to provide a thorough understanding of the invention. However, it will be understood by

those skilled in the art that the present invention may be practiced without these specific

details. In other instances, well-known methods, procedures, components and circuits

20   have not been described in detail so as not to obscure the present invention.

Some portions of the detailed description which follow are presented in terms of

algorithms and symbolic representations of operations on data bits or binary digital signals

within a computer memory. These algorithmic descriptions and representations are the

techniques used by those skilled in the data processing arts to convey the substance of

their work to others skilled in the art.

An algorithm is here, and generally, considered to be a self-consistent sequence of

acts or operations leading to a desired result. These include physical manipulations of

physical quantities. Usually, though not necessarily, these quantities take the form of

electrical or magnetic signals capable of being stored, transferred, combined, compared,

and otherwise manipulated. It has proven convenient at times, principally for reasons of

common usage, to refer to these signals as bits, values, elements, symbols, characters,

terms, numbers or the like. It should be understood, however, that all of these and similar

terms are to be associated with the appropriate physical quantities and are merely

convenient labels applied to these quantities.

Unless specifically stated otherwise, as apparent from the following discussions, it

is appreciated that throughout the specification discussions utilizing terms such as

"processing" or "computing" or calculating" or "determining" or the like, refer to the

action and processes of a computer or computing system, or similar electronic computing

device, that manipulate and transform data represented as physical (electronic) quantities

within the computing system's registers and/or memories into other data similarly

represented as physical quantities within the computing system's memories, registers or

other such information storage, transmission or display devices.

Embodiments of the present invention may include apparatuses for performing the

operations herein. This apparatus may be specially constructed for the desired purposes,

or it may comprise a general purpose computer selectively activated or reconfigured by a

computer program stored in the computer. Such a computer program may be stored in a computer readable storage medium, such as, but is not limited to, any type of disk including floppy disks, optical disks, CD-ROMs, magnetic-optical disks, read-only memories (ROMs), random access memories (RAMs), electrically programmable read-only

5   memories (EPROMs), electrically erasable and programmable read only memories (EEPROMs), magnetic or optical cards, or any other type of media suitable for storing electronic instructions, and each coupled to a computer system bus.

The algorithms and displays presented herein are not inherently related to any particular computer or other apparatus. Various general purpose systems may be used

10   with programs in accordance with the teachings herein, or it may prove convenient to construct a more specialized apparatus to perform the desired method. The desired structure for a variety of these systems will appear from the description below. In addition, embodiments of the present invention are not described with reference to any particular programming language. It will be appreciated that a variety of programming

15   languages may be used to implement the teachings of the invention as described herein.

Referring to FIG. 1, a processor-based, computing system 10 may include a processor 12 coupled to an interface 14. Although the scope of the present invention is not limited so as to require interface 14, interface 14 may be a bridge or a part of a chipset, for example. Interface 14 may be coupled to a graphics controller 18, for

20   example, by an accelerated graphics port (AGP) bus 16 (see Accelerated Graphics Port Interface Specification, Rev. 1.0, published on July 31, 1996 by Intel Corporation, Santa Clara, California). Controller 18 may control a display 20 to display information generated and processed by processor 12, for example. Interface 14 may also be coupled to a host

system memory 21. Host system memory 21, for example a disk drive, cache memory,

or static random access memory (SRAM), may be a machine-readable storage medium

that may be used to provide the instructions executed by processor 12.

Interface 14 may also be coupled to a bus 22. Although the scope of the present

5   invention is not limited in this respect, in one embodiment, bus 22 may comprise a

Peripheral Component Interconnect (PCI) bus which is compliant with the PCI Local Bus

Specification, Rev. 2.1, dated June 1, 1995 and available from the PCI Special Interest

Group, Portland, OR 97214.

Bus 22 may also optionally be coupled to an interface 24, which may be part of a

10   chipset or which may be implemented by a bridge, for example, although the scope of the

present invention is not limited in this respect. Also coupled to bus 22, may be an

input/output (I/O) device 26, which may be a host adapter in one embodiment of the

invention. I/O device 26 may be, for example, a SCSI Fibre Channel (ANSI Standard

X.3230-1994-Fibre Channel Physical and Signaling Standard (FC-PH) available at

15   http://www.fibrecannel.com/technology/tech-frame.htm), an Ethernet device, or a Next

Generation I/O (NGIO) device (available at

http://www.clients.activate.net.telspan/ngioforum/072199.htm).

Computing system 10 may also include an Intelligent Input/Output (I_2O) device 30,

which in turn, may be coupled to one or more disk drives 35. Although not limited in

20   scope in this respect, I_2O device 30 may optionally include components such as non-

volatile memory, an SCSI controller, and a processor such as the i960®Rx I/O processor

available from Intel Corporation, Santa Clara, CA. In the embodiment illustrated in FIG. 1,

I_2O device 30 is coupled to a storage medium, such as disk drive(s) 35, which represent

any storage medium that may be used to implement a redundant array of inexpensive disks (RAID) data storage process. Although the scope of the present invention is not limited in this respect, in this embodiment I_2O device 30 is intended to perform at least some of the instructions used to store and retrieve data in a RAID system so as to reduce the burden on processor 12 of system 10. Computing system 10 may also include other modules or components 32 as desired.

During the operation of system 10, situations may occur in either hardware or software that prompt system 10 to respond accordingly. These situations may occur either externally to computing system 10, such as in peripherals like storage mediums, or the situations may occur internally in the software operating within computing system 10. These situations are referred to as events. Although the scope of the present invention is not limited in this respect, examples of events that may occur in a computing system using a RAID process to store data include: notification that a disk drive has failed or is about to fail, a change in the spin rate or temperature of a disk drive, expiration of the predicted lifetime of a disk drive, array migrations, initialization of disk drives, redistribution of data after a drive failure, recovery of data from remaining disks upon failure of one or more disks, start or end of a disk format, an array expansion by adding more disks, or deletion or creation of a raid volume.

Again, the term "event" need not be limited to situations associated with a disk drive in a RAID system and the type of events to be reported are not meant to be limited to those described above. In alternative embodiments of the present invention, the occurrence of other types of "events" may be communicated such as ones associated with, for illustration only, peripheral communications, security, data processing, power

management, etc.

Referring now to FIG. 2, an embodiment that provides for communicating the occurrence of an event to other applications is provided. In the embodiment illustrated in FIG. 2, each of the various components is implemented as a software routine, program, or

5   a dynamic linked library (DLL). However, it should be understood that in other embodiments of the present invention, various modules shown in FIG. 2 may be implemented as hardware, for example logic circuits, programmable logic arrays (PLA's), or the like. Furthermore, it should be understood that the scope of the present invention is not limited to computing systems that operate each and every module shown in FIG. 2.

10   For example, alternative embodiments may not perform all of the modules shown, or some of the modules may be performed by other computing systems (not shown). Moreover, some of the functions shown in FIG. 2 may be combined into one computer program or separated into several independently running programs.

FIG. 2 is a block diagram representation of various modules that may be operating

15   on processors within or external to computing system 10. The illustration is intended to demonstration how the various modules are communicatively coupled to each other in this particular embodiment while computing system 10 is in operation. The following embodiment is described as it may be implemented in a Windows NT ® platform. Windows NT ® is a registered trademark of Microsoft Corporation, Redmond, WA.

20   However, the present invention may also be implemented on other software platforms, such as Linux, UnixWare, or the like.

FIG. 2 includes a Windows NT® Operating System Services Module (OSM) 50, which may be used to manage the interaction between the operating system running on

computing system 10 and external peripherals via bus 22. Operating above Windows NT®

OSM 50 may be a RAID monitor service program 51 that coordinates the RAID process

between a host processor (e.g., processor 12) and an I_2O controller (e.g., I_2O device 30).

Among other things, RAID monitor service 51 may record, track, and report events that

5   are detected by I_2O controllers or other peripheral controllers.

Abstracted from, and residing above, RAID monitor service 51, is an event

application programming interface (API) 55 which may be used to notify one or more

desktop management applications 60 (hereinafter, management applications or

applications) of the occurrence of an event(s). However, the scope of the present

10   invention is not limited to this particular event API as alternative programming interfaces

may also be used. Management application(s) 60 may be programs, routines, algorithms,

DLL's, or the like that are being executed by the host processor. Examples of

management applications include: Simple Network and Management Protocol Extension

Agents (SNMP's), Desktop Management Interface Component Instrumentation (DMI's),

15   RAID monitor applications, or like. However, it should be understood that the scope of

the present invention is not restricted in this respect as the embodiments of the present

invention may be used to communicate the occurrence of virtually any event to any

application that requests such information.

Referring to FIG. 3, an embodiment of a process for registering a management

20   application 60 with an event API 55 is now provided. At box 100, management

application 60 provides event API 55 with registration parameters associated with an

event. For example, management application 60 may provide information that identifies

by name or numeric value the I/O processor, the storage medium, or the type of event

that event API 55 is to notify management application 60 of. It should also be

understood that the values or identification information provided may be optionally coded,

if desired.

Management application 60 may also provide event API 55 with a callback

5   function. The callback function may identify the response to be taken by either

management application 60 or another program running on computer system 10. For

example, the callback function may identify the routine or DLL to be executed once event

API 55 notifies management application 60 of the occurrence of the event. Although the

scope of the present invention is not limited in this respect, management application 60

10   may provide this information to event API 55 in the form of a data structure that includes

fields associated with each piece of event information.

Upon receipt, event API 55 determines if the parameters are valid, box 101. If the

registration request does not contain valid information, then event API 55 may return a

NULL character, box 102, to indicate that registration has not occurred. If the request is

15   valid, then event API 55 may allocate memory and store the data or the data structure

associated with the event that event API 55 is to notify management application 60 of,

box 103.

Once the data has been stored, event API 55 establishes a connection (e.g., an

interprocess communication) with RAID monitor service 51 through a named pipe. Event

20   API 55 may store the handle as part of the data associated with the event to be reported,

box 104. As explained in more detail below, the handle data may later be used by

management application 60 to unregister itself with event API 55.

Once registered, event API 55 monitors the events, including hardware events, that

occur within computing system 10. This includes the events that are reported through

Window NT® OSM 50 and RAID monitor service 51. During the operation of computing

system 10, RAID monitor service 51 may constantly or periodically update event API 55

with events that have recently occurred. If an event occurs that is of the type previously

5   registered, event API 55 may use the callback function information to notify management

application 60 of the occurrence of the event. Event API 55 may also provide

management application 60 with any data associated with the event or the context that

was originally specified by management application 60 when it registered with event API

55.

10   If event API 55 has notified management application 60 of the occurrence of a

particular event, or if management application 60 no longer desires to be notified of a

particular event, management application 60 may unregister itself with event API 55. To

do so, management application 60 may simply pass the handle associated with the

registration of this particular event, see box 104 of FIG. 2, so that event API 55 will

15   proceed as if that handle was invalid.

In the embodiments described above, management application 60 registered a

single event with event API 55. However, it should be understood that the scope of the

present invention is not limited in this respect as different management applications may

register with the event API, each to be notified of the same event, or one management

20   application may register several events that the event API is to notify that management

application once those events occur.

One advantage of the embodiments of the present invention is that desktop

management applications may now be notified of the occurrence of events without having

to actively search for their occurrence. This improves the efficiency of the management

applications as they no longer have to randomly or periodically poll the RAID monitor

service to check if an event has occurred. This also improves the response time of the

management application as the management application may be notified of the occurrence

5   of an event as soon as the event API becomes of aware of it.

The present invention also provides the management application with information

that was previously unavailable and not supported on Windows NT® platforms. Thus, the

functionality and flexibility of the management applications may be improved.

Furthermore, embodiments of the present invention also obviate the need to modify each

10   management application should there be a change in the event information provided by a

RAID system. For example, if the format for reporting events by the RAID process should

change, only the event API may need be updated to reflect any changes. It is not

necessary that each management application be modified since the event API abstracts

the event reporting function. This improves the compatibility of the applications that may

15   run within a computing system and provides for seamless transitions if the RAID process

is modified.

While certain features of the invention have been illustrated and described herein,

many modifications, substitutions, changes, and equivalents will now occur to those

skilled in the art. It is, therefore, to be understood that the appended claims are intended

20   to cover all such modifications and changes as fall within the true spirit of the invention.

Claims:

1. A method of indicating occurrence of an event from a redundant array of

inexpensive disks (RAID) monitor service to a management application,

comprising:

5   registering the management application with an event application programming

interface;

detecting occurrence of an event with the RAID monitor service; and

notifying the management application program of the event via the event

application programming interface.

10

2. The method of claim 1, further comprising updating the event application

programming interface with the RAID monitor service upon occurrence of the event.

3. The method of claim 1, wherein registering the management application includes

15   identifying a storage medium associated with the event.

4. The method of claim 1, wherein registering the management application includes

identifying the type of event.

20   5. The method of claim 1, wherein registering the management application includes

providing the event application programming interface with a callback function.

6. The method of claim 5, wherein the event application programming interface uses the callback function to notify the management application of the occurrence of the event.

5

7. The method of claim 1, wherein registering the management application includes creating an interprocess communication between the RAID monitor service and the management application.

8. The method of claim 1, further comprising the step of unregistering the management application with the event application programming interface upon notification of the event.

10

9. The method of claim 1, wherein the event application programming interface returns a callback function upon notification of the event.

15

10. A method for notifying an application of the occurrence of a hardware event

comprising:

registering the application with a programming interface; and

upon occurrence of the hardware event, notifying the application.

5

11. The method of claim 10, wherein registering the application includes:

allocating a data storage location; and

storing data in the data storage location.

10   12. The method of claim 11, wherein storing the data includes storing data

identifying an input/output processor.

13. The method of clam 11, wherein storing the data includes storing data

identifying the hardware event that the programming interface notifies the application of

15   once the hardware event has occurred.

14. The method of claim 11, wherein storing the data includes storing a hardware

identification value that identifies a storage medium associated with the event.

20   15. The method of claim 10, further comprising notifying the programming

interface of the occurrence of the hardware event with a RAID monitor service.

16. The method of claim 10, wherein notifying the application includes providing a

callback function.

17. An article comprising:

a machine readable storage medium having stored thereon instructions capable of

being executed by a data processing platform, said instructions being adapted to register

5   a management application with a programming interface so that the programming

interface is capable of notifying the management application of an event from a RAID

monitor service.

18. The machine readable storage medium of claim 17, wherein said instructions

10   are further adapted to unregister the management application.

19. The machine readable storage medium of claim 17, wherein said instructions

are further adapted to notify the management application of a hardware event.

20. The machine readable storage medium of claim 19, wherein the hardware event

15   is selected from the group consisting of a disk drive failure, disk drive initialization, array

migration, and data recovery.

21. The machine readable storage medium of claim 17, wherein said instructions

20   are further adapted to register a processor identification value.

22. An article comprising:

a processor;

a medium for storing instructions;

a medium for storing data;

5   wherein instructions on the medium for storing instructions are adapted to cause

the processor to indicate the occurrence of an event with the medium for storing data

from a programming interface to a management application.

23. The article of claim 22, wherein the management application is selected from

10   the group consisting of a desktop management program, a RAID system management

application, and a RAID monitor application.

24. The article of claim 22, further comprising a RAID monitor service.

15   25. The article of claim 24, further comprising an intelligent input/output controller.

26. An apparatus comprising:

a processor;

a RAID monitor service;

an event programming interface;

5   a management application, wherein the event programming interface is adapted to

notify the management application of an event from the RAID monitor service.

27. The apparatus of claim 26, further comprising a storage medium, wherein the

storage medium comprises instructions that cause the processor to register the

10   management application with the event programming interface.

28. The apparatus of claim 27, wherein the storage medium further comprises

instructions that cause the processor to provide the function of the event programming

interface.

METHOD FOR COMMUNICATING OCCURRENCE OF EVENTS IN A STORAGE MEDIUM

Abstract

5   Briefly, in accordance with one embodiment of the invention, a computing system

includes an event programming interface and a management application. The

management application is communicatively coupled to the event programming interface

so that the management application may register an event that the event programming

interface will notify the management application once that event has occurred. In one

10   embodiment, the event programming interface may notify the management application of

the occurrence of an event that is associated with a storage medium in a RAID process.
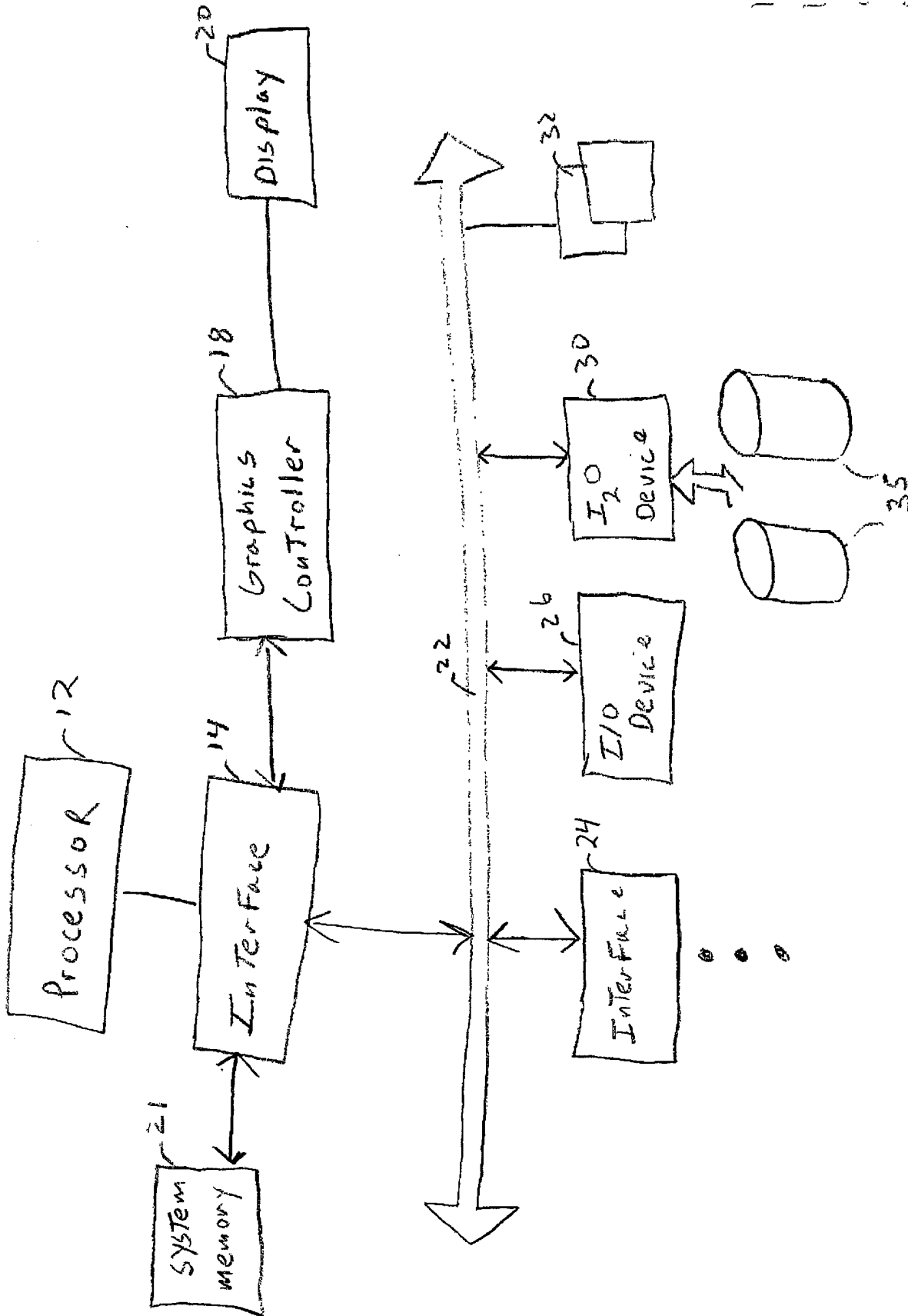
FIG. 1

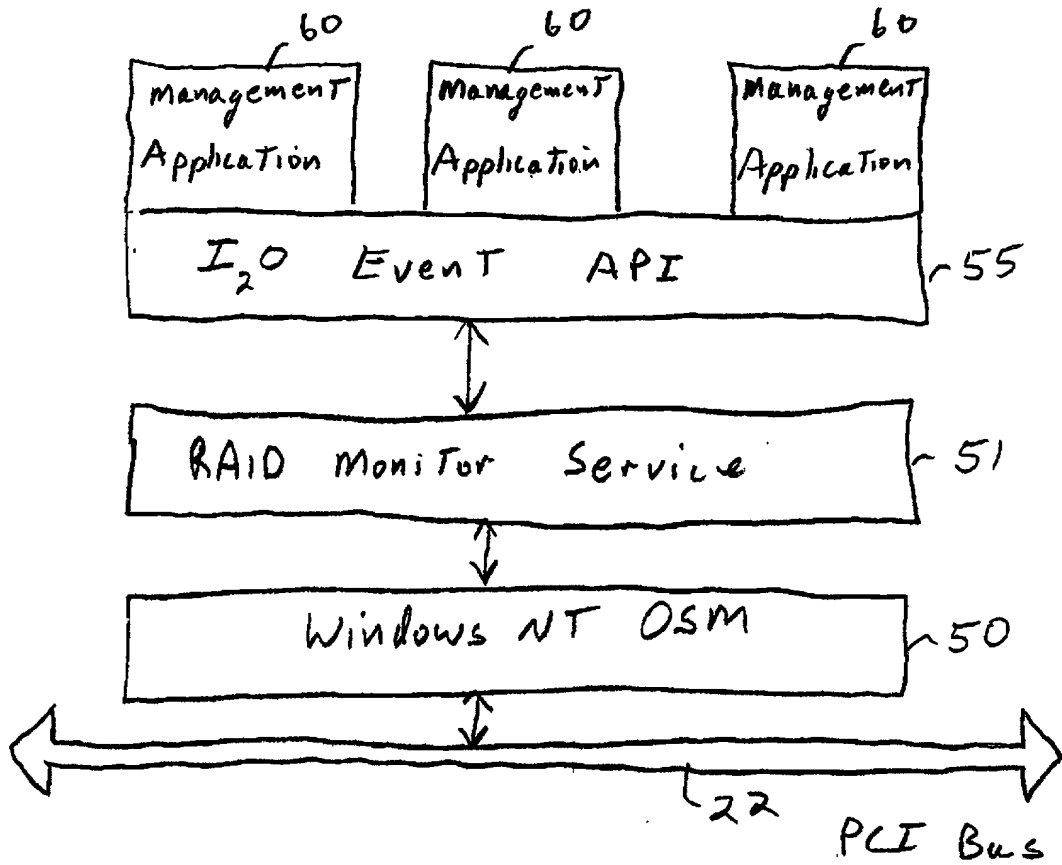| Management Application	Management Application	Management Application

60   60   60

I_2O Event API   ~55

RAID Monitor Service   ~51

Windows NT OSM   ~50

22   PCI Bus

FIG. 2

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┌─────────────────────────┐
│  Provide  RegisTraTion   │──── 100
│      ParamEters          │
└─────────────────────────┘
            │
            ▼
         ╱╲
        ╱  ╲ ── 101
       ╱Valid╲          NO      ┌────────┐
       ╲Parameters╲ ──────────▶ │ ReTurn │ ── 102
        ╲  ╱                    └────────┘
         ╲╱
          │
         Yes
          │
          ▼
┌─────────────────────────┐
│  STore   RegisTraTion    │── 103
│         DaTa             │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│   STore  handle  daTa    │── 104
└─────────────────────────┘
```
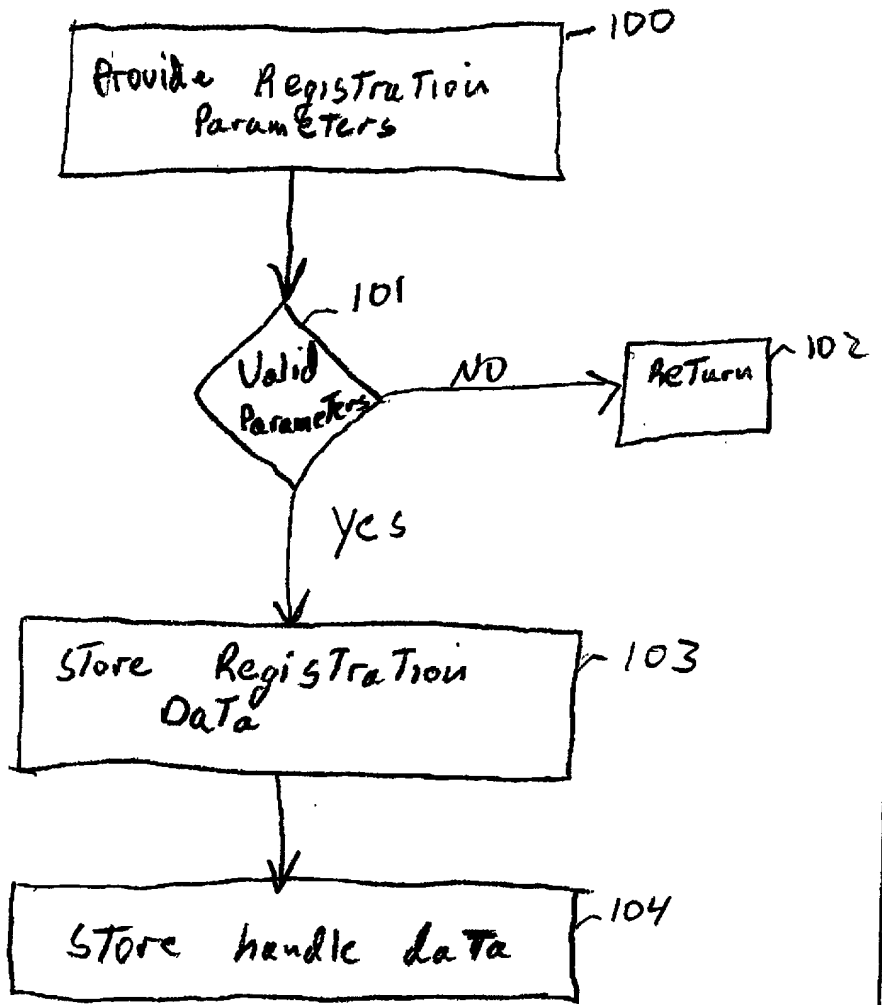
FIG. 3

42390⦿P7752

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION
(FOR <u>INTEL CORPORATION</u> PATENT APPLICATIONS)

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below, next to my name.

I believe I am the original, first, and sole inventor (if only one name is listed below) or an original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

METHOD FOR COMMUNICATING OCCURRENCE OF EVENTS IN A STORAGE MEDIUM

the specification of which

[X] is attached hereto.
[ ] was filed on _____ as___
    United States Application Number _____
    or PCT International Application Number _____
    and was amended on _____ .
                                  (if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment referred to above. I do not know and do not believe that the claimed invention was ever known or used in the United States of America before my invention thereof, or patented or described in any printed publication in any country before my invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, and that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months (for a utility patent application) or six months (for a design patent application) prior to this application.

I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d), of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

<u>Prior Foreign Application(s)</u>:

APPLICATION NUMBER	COUNTRY (OR INDICATE IF PCT)	DATE OF FILING (day, **month**, year)	PRIORITY CLAIMED UNDER 37 USC 119
			[ ] No [ ] Yes
			[ ] No [ ] Yes
			[ ] No [ ] Yes

I hereby claim the benefit under Title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below:

APPLICATION NUMBER	FILING DATE

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

APPLICATION NUMBER	FILING DATE	STATUS (ISSUED, PENDING, ABANDONED)

I hereby appoint BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP, a firm including: William E. Alford, Reg. No. 37,764; Farzad E. Amini, Reg. No. P42,261; Aloysius T. C. AuYeung, Reg. No. 35,432; William Thomas Babbitt, Reg. No. 39,591; Carol F. Barry, Reg. No. 41,600; Jordan Michael Becker, Reg. No. 39,602; Bradley J. Bereznak, Reg. No. 33,474; Michael A. Bernadicou, Reg. No. 35,934; Roger W. Blakely, Jr., Reg. No. 25,831; Gregory D Caldwell, Reg. No. 39,926; Ronald C. Card, Reg. No. 44,587; Thomas M. Coester, Reg. No. 39,637; Stephen M. De Klerk, under 37 C.F.R. § 10.9(b); Michael Anthony DeSanctis, Reg. No. 39,957; Daniel M. De Vos, Reg. No. 37,813; Robert Andrew Diehl, Reg. No. 40,992; Matthew C. Fagan, Reg. No. 37,542; Tarek N. Fahmi, Reg. No. 41,402; James Y. Go, Reg. No. 40,621; James A. Henry, Reg. No. 41,064; Willmore F. Holbrow III, Reg. No. P41,845; Sheryl Sue Holloway, Reg. No. 37,850; George W Hoover II, Reg. No. 32,992; Eric S. Hyman, Reg. No. 30,139; Dag H. Johansen, Reg. No. 36,172; William W. Kidd, Reg. No. 31,772; Erica W. Kuo, Reg. No. 42,775; Michael J. Mallie, Reg. No. 36,591; Andre L. Marais, under 37 C.F.R. § 10.9(b); Paul A. Mendonsa, Reg. No. 42,879; Darren J. Milliken, Reg. 42,004; Lisa A. Norris, Reg. No. P44,976; Chun M. Ng, Reg. No. 36,878; Thien T. Nguyen, Reg. No. 43,835; Thinh V. Nguyen, Reg. No. 42,034; Dennis A. Nicholls, Reg. No. 42,036; Kimberley G. Nobles, Reg. No. 38,255; Daniel E. Ovanezian, Reg. No. 41,236; Babak Redjaian, Reg. No. 42,096; William F. Ryann, Reg. 44,313; James H Salter, Reg. No. 35,668; William W. Schaal, Reg. No. 39,018; James C. Scheller, Reg. No 31,195; Jeffrey Sam Smith, Reg. No. 39,377; Maria McCormack Sobrino, Reg. No. 31,639; Stanley W. Sokoloff, Reg. No. 25,128; Judith A. Szepesi, Reg. No. 39,393; Vincent P. Tassinari, Reg. No. 42,179; Edwin H. Taylor, Reg. No. 25,129; John F. Travis, Reg. No 43,203; George G. C. Tseng, Reg. No. 41,355; Joseph A. Twarowski, Reg. No. 42,191; Lester J. Vincent, Reg. No. 31,460; Glenn E. Von Tersch, Reg. No. 41,364; John Patrick Ward, Reg. No. 40,216; Charles T. J. Weigell, Reg. No. 43,398; Kirk D. Williams, Reg. No. 42,229; James M. Wu, Reg. No. P45,241; Steven D. Yates, Reg. No. 42,242; Ben J. Yorks, Reg. No. 33,609; and Norman Zafman, Reg. No. 26,250; my patent attorneys, and Andrew C. Chen, Reg. No. 43,544; Justin M. Dillon, Reg. No. 42,486; Paramita Ghosh, Reg. No. 42,806; and Sang Hui Kim, Reg. No. 40,450; my patent agents, of BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP, with offices located at 12400 Wilshire Boulevard, 7th Floor, Los Angeles, California 90025, telephone (310) 207-3800, and Alan K. Aldous, Reg. No. 31,905; Robert D. Anderson, Reg. No. 33,826; Joseph R. Bond, Reg. No 36,458; Richard C. Calderwood, Reg. No. 35,468; Jeffrey S. Draeger, Reg. No. 41,000; Cynthia Thomas Faatz, Reg No. 39,973; Sean Fitzgerald, Reg. No. 32,027; Seth Z. Kalson, Reg. No. 40,670; David J. Kaplan, Reg. No. 41,105; Charles A. Mirho, Reg. No. 41,199; Leo V Novakoski, Reg No. 37,198; Naomi Obinata, Reg. No. 39,320; Thomas C. Reynolds, Reg. No. 32,488; Kenneth M. Seddon, Reg. No. 43,105; Mark Seeley, Reg. No. 32,299; Steven P. Skabrat, Reg. No. 36,279; Howard A. Skaist, Reg. No. 36,008; Steven C. Stewart, Reg. No. 33,555; Raymond J. Werner, Reg. No. 34,752; Robert G. Winkle, Reg. No. 37,474; and Charles K. Young, Reg. No. 39,435; my patent attorneys, and Thomas Raleigh Lane, Reg. No. 42,781; Calvin E. Wells; Reg. No. P43,256, Peter Lam, Reg. No. P44,855; and Gene I. Su, Reg. No. 45,140; my patent agents, of INTEL CORPORATION; and James R. Thein, Reg. No. 31,710, my patent attorney; with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith.

Send correspondence to <u>Aloysius T.C. AuYeung, Reg. No. 35,432</u>, BLAKELY, SOKOLOFF, TAYLOR &
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ZAFMAN LLP, 12400 Wilshire Boulevard, 7th Floor, Los Angeles, California 90025 and direct telephone calls to <u>Aloysius T.C. AuYeung, Reg. No. 35,432</u>, (503) 684-6200.
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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Title 37, Code of Federal Regulations, Section 1.56
Duty to Disclose Information Material to Patentability

(a) A patent by its very nature is affected with a public interest. The public interest is best served, and the most effective patent examination occurs when, at the time an application is being examined, the Office is aware of and evaluates the teachings of all information material to patentability. Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section. The duty to disclosure information exists with respect to each pending claim until the claim is cancelled or withdrawn from consideration, or the application becomes abandoned. Information material to the patentability of a claim that is cancelled or withdrawn from consideration need not be submitted if the information is not material to the patentability of any claim remaining under consideration in the application. There is no duty to submit information which is not material to the patentability of any existing claim. The duty to disclosure all information known to be material to patentability is deemed to be satisfied if all information known to be material to patentability of any claim issued in a patent was cited by the Office or submitted to the Office in the manner prescribed by §§1.97(b)-(d) and 1.98. However, no patent will be granted on an application in connection with which fraud on the Office was practiced or attempted or the duty of disclosure was violated through bad faith or intentional misconduct. The Office encourages applicants to carefully examine:

(1)   Prior art cited in search reports of a foreign patent office in a counterpart application, and

(2)   The closest information over which individuals associated with the filing or prosecution of a patent application believe any pending claim patentably defines, to make sure that any material information contained therein is disclosed to the Office.

(b)   Under this section, information is material to patentability when it is not cumulative to information already of record or being made or record in the application, and

(1)   It establishes, by itself or in combination with other information, a prima facie case of unpatentability of a claim; or

(2)   It refutes, or is inconsistent with, a position the applicant takes in:

(i)   Opposing an argument of unpatentability relied on by the Office, or

(ii)   Asserting an argument of patentability.

A prima facie case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability.

(c)   Individuals associated with the filing or prosecution of a patent application within the meaning of this section are:

(1)   Each inventor named in the application;

(2)   Each attorney or agent who prepares or prosecutes the application; and

(3)   Every other person who is substantively involved in the preparation or prosecution of the application and who is associated with the inventor, with the assignee or with anyone to whom there is an obligation to assign the application.

(d)   Indivic